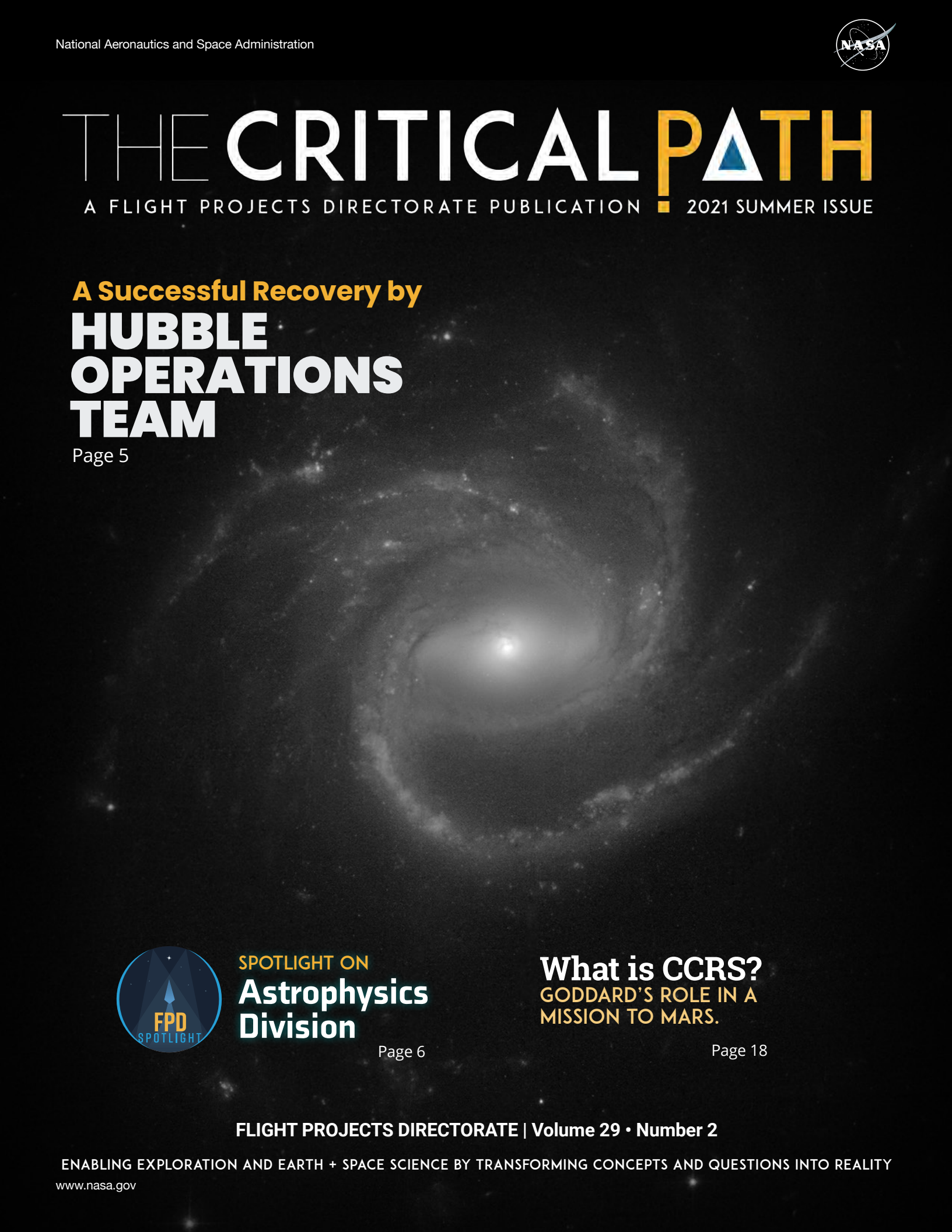
National Aeronautics and Space Administration

THE CRITICAL PATH

A FLIGHT PROJECTS DIRECTORATE PUBLICATION | 2021 SUMMER ISSUE



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FLIGHT PROJECTS DIRECTORATE | Volume 29 • Number 2

ENABLING EXPLORATION AND EARTH + SPACE SCIENCE BY TRANSFORMING CONCEPTS AND QUESTIONS INTO REALITY

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COVER IMAGE: This image of the three-armed spiral galaxy ARP-MADORE0002-503 is one of the first captured by the Hubble Space Telescope after science operations resumed on July 17, 2021. Hubble's science instruments went into safe mode on June 13, 2021 due to an issue with its payload computer. The Hubble team resolved the problem by switching to the backup side of the Science Instrument and Command & Data Handling unit. CREDIT: SCIENCE: NASA, ESA, STSCI, JULIANNE DALCANTON (UW) IMAGE PROCESSING: ALYSSA PAGAN (STSCI)

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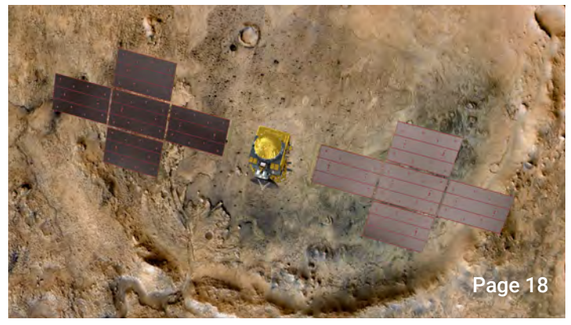
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THE CRITICAL PATH
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PUBLISHED BY THE FLIGHT PROJECTS DIRECTORATE

TCP TEAM
Michelle Belleville
Maureen Disharoon
Sarah Harnish
Laura Paschal
Reese Patillo
Jennifer Poston
David Ryan
Shannon Smith
Paula Wood

SUPERVISING EDITOR
Donna Swann

Code 400

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http://fpd.gsfc.nasa.gov

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paula.l.wood@nasa.gov
Code 460
Ext. 6-9125

The deadline for the next issue is **November 1, 2021**

DOWNLOAD ISSUE

Message from the DIRECTOR

It is astounding to believe we are nearing the end of 2021 in anticipation of five Goddard launches in the coming months (the Laser Communication Relay Demonstration payload, Landsat 9, Lucy, James Webb Space Telescope, and Geostationary Operational Environmental Satellite-T), in addition to supporting the Imaging X-ray Polarimetry Explorer out of Marshall Space Flight Center, managed by our Explorers Program. After an immensely challenging period, the excitement and historic impact of these missions provide opportunities to appreciate the Directorate and Center's many successes and continued progress.

We recognize that we are far from the end of this pandemic but as we settle into this new normal, the Directorate is committed to continuing to support our teams as they make progress on all proposals, flight project development, and continued mission operation excellence in this environment. In coordination with NASA Headquarters, we have also been engaged in the assessment and development of some new program offices that have been assigned or will likely be located at Goddard in the future.

All of our projects have successfully completed testing, development, instrument, and lifecycle milestones over the last six months. Our monthly highlights, which can be found here, offer a great overview of these successes. I want to highlight two high-profile accomplishments from this period.

First, Hubble experienced an anomaly with its payload computer on June 13, halting science operations for more than a month. After weeks of intense analysis and testing, the team performed a complex "side switch" procedure to restore Hubble to normal science operations. The team was recognized for their outstanding efforts in a recent visit by NASA's Science Mission Directorate Associate Administrator, Thomas Zurbuchen and Center Director, Dennis Andrucyk.

Additionally, Goddard celebrated the award of the Deep Atmosphere Venus Investigation of Noble gases, Chemistry, and Imaging (DAVINCI) mission, part of NASA's Discovery program. The mission builds upon Goddard's critical subject matter expertise and project management strengths to develop the first probe to enter Venus's atmosphere in decades. The mission includes seven instruments, including the Venus Mass Spectrometer, being developed by Code 490 in collaboration with the University of Michigan. Goddard is also developing the sensor systems on two of the other instruments.

Lastly, I want to extend my appreciation to all of those that engaged in the Directorate's events over the last few months, especially our FPDFest celebration recognizing so many of our peers and their outstanding achievements (click here for the full list of peer award winners). We also held several intern events serving our summer intern program as well as continued "Let's CONNECT" events and a recent women's equality discussion. I want to recognize the Flight Projects Development Program Cohort #4 participants on completion of their first year and thank all of the mentors and administrators who ensure the program's success. We are looking forward to our Fall recruitment for our upcoming Cohort #5.

Thank you to our teams for continuing to make so many of NASA's dreams a reality.

Stay safe and take care of one another! ■

Tom McCarthy
Director, Flight Projects
thomas.v.mccarthy@nasa.gov

CONGRATULATIONS TO THE Hubble Team!

Associate Administrator for Science Thomas Zurbuchen Congratulates Hubble Team

Goddard Center Director, Dennis Andrucyk, joined NASA Associate Administrator for Science, Thomas Zurbuchen, on August 18 to congratulate the Hubble Space Telescope operations team on the successful recovery of the telescope. Hubble experienced an anomaly with its payload computer on June 13, halting science operations for more than a month. After weeks of intense analysis and testing, the team performed a complex "side switch" procedure to restore Hubble to normal science operations. The effort required the support of many team members with a wide range of expertise and years of experience, including some retired staff who helped build the telescope. Hubble's successful recovery not only brought one of NASA's most beloved telescopes back online, but also serves as a testament to the tenacity and dedication of the entire operations team. Dennis thanked the Hubble team for this extraordinary effort to extend the life of this remarkable telescope, hopefully for years to come.

Hubble teams celebrate the successful culmination of their joint efforts to bring Hubble back online. CREDIT: NASA

Paving the Path to Cosmic Discoveries

FPD SPOTLIGHT

The Astrophysics Division guides missions from concept development to managing operations

Recent decades have brought a flood of astronomical knowledge. Humanity discovered an astonishing wealth of planets around other stars. Deep field images of the universe opened windows into the time close to the Big Bang. The expanding universe was found to be unexpectedly and mysteriously accelerating. The centers of most galaxies turned out to be hiding giant black holes.

Discoveries such as these have pried open the doors to some of humanity's biggest questions about the cosmos: Are we alone? How did we get here? How does our universe work? These three questions are at the core of NASA Goddard's Astrophysics Projects Division (APD), Code 440, dedicated to exploring the nature of the universe at its largest scales, its earliest moments, and its most extreme conditions; discovering how galaxies and stars formed and evolved; and seeking out and characterizing planets around other stars.

"Those are very compelling questions for everyone," said Barbara Grofic, APD manager. "Even my young grandchildren can understand what we're doing here. People need to ponder the big questions like where we come from. That's part of who we are. So we do. We help make that happen."

NASA's Astrophysics Division is divided into three thematic areas: Cosmic Origins (COR), which focuses on "How did we get here?" Physics of the Cosmos (PCOS), which tackles "How does our universe work?" and Exoplanet Exploration, which centers on "Are we alone?" The Cosmic Origins and Physics of the Cosmos Programs are based at Goddard, while Exoplanet Exploration is based at Jet Propulsion Laboratory in California.

Galaxy UGC 288, named "Rubin's Galaxy" after astronomer Vera Rubin, is the largest-known galaxy in the local universe and contains 10 times as many stars as our Milky Way. This observation kickstarted the Hubble Space Telescope's 30th anniversary year in 2020. Hubble is one of the missions managed by APD. CREDIT: NASA

The Hubble Space Telescope operations team at Goddard's Space Telescope Operations Control Center works to resolve an issue with the telescope's payload computer that put the instruments into safe mode. Hubble resumed science operations on July 17, 2021 following a switch to the backup side of the Science Instrument and Command & Data Handling unit. CREDIT: NASA

APD explores these questions through its suite of operating spacecraft and the pre-formulation of future science missions. In addition to PCOS and COR science, the program includes two projects: the Hubble Space Telescope and Space Science Mission Operations (SSMO), which manages mission operations for heliophysics, astrophysics, and planetary science missions and is involved in mission concept development, ground system development, integration and testing, and operations readiness preparations.

"We also specialize in doing missions before they're in development, before they go to phase A, with a heavy focus on technologies," Grofic said. "Usually only a big mission has a defined pre-phase A, so it's mostly the big ones that come through APD."

APD works on both technology development and maturation, ushering concepts and technologies from demonstrated feasibility to the point where they can be incorporated into NASA flight missions. The process includes assessing and prioritizing technology gaps, managing projects that advance technologies, promoting the infusion of technologies into missions and projects, conducting mission studies and developing mission concepts to enable future scientific discoveries, and communicating progress to the scientific community and the public.

"Our team is constantly looking at what is the state of the art or the capabilities that are out there, but if you want to go to the next level, what kind of tool would you need for that," said Cathy Barclay, APD deputy manager. "We look at the systems we have that can do this, and if only that system could be more precise or more stable it would help achieve more sensitivity in looking out at the sky. We look at the tools that are available and the gaps between what we can do versus what we need. And then we hold competitions every year to give fair opportunity for people to try to improve and resolve those gaps."

The technology goes hand in hand with strategic planning for science goals, interpreting the results of the National Academies Decadal Survey among other research. "What happens there is all the fruits of what we've done," Barclay said. "The Hubble data, all the other 20 missions' data out of SSMO — people are writing papers on that, taking those images and measurements and drawing these conclusions that are just amazing. So we help review those and stay current on those, and that helps lead back to what we should do next."

APD's best-known mission is likely the Hubble Space Telescope — which celebrated the 30th anniversary of its 1990 launch date in 2020 — but few realize that APD has over 20 missions in orbit, many of which have surpassed their expected lifespans, including the Solar and Heliospheric Observatory (SOHO), Fermi Space Telescope, and the Advanced Composition Explorer (ACE). "We have occasional anomalies and we work through them and get things solved, and go back to business," Grofic said. "We've got the mission that launched in 1990 and the missions launching in 2036, so we've got the beginnings and the future. They're all extremely exciting in terms of new science coming out all the time and giving us a new picture of what the universe looks like."

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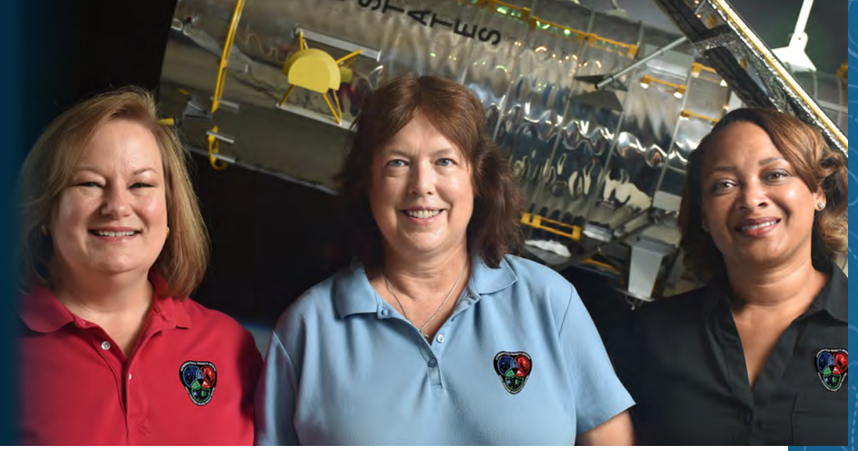
A Leadership Hat Trick

3 WOMEN LEAD APD



(left to right): Deputy Program Manager Cathy Barclay, Program Manager Barbara Grofic and APD Program Business Manager Tracy Felton-Robinson. CREDIT: NASA

Barbara Grofic, Physics of the Cosmos (PCOS) and Cosmic Origins (COR) Program Manager and Associate Director for FPD, grew up identifying with "Star Trek." "They showed a picture of the future with a diverse population up there on the Enterprise that I wanted to be a part of." But it was also a vision that the all-male teams of astronauts that she saw traveling into space couldn't meet.

Attending Smith College, where she earned a bachelor's degree in astronomy and mathematics, nurtured the interests that led Grofic to NASA. "It was an all-women's college, so I started right from the beginning not recognizing any limits where women were concerned."

Cathy Barclay, deputy program manager for the Physics of the Cosmos (PCOS) and Cosmic Origins (COR) programs and deputy associate director for the Flight Project Directorate (FPD), recalls the times, going back as far as college, when she would look around a room and note how many women were in it. In one, perhaps, three out of 30. In another, perhaps just herself. "Even getting into the working world I would often notice: How many women are in this room," she said.

In fact, it wasn't until she was writing up a Women's Advisory Committee award nomination for a coworker that it struck her that the top roles in the Astrophysics Division management team she had recently joined were all filled with women. "It gave me pause for a moment," she said. "It had finally become you don't notice until something brings it to light."

Barclay, who spent 35 years working in communications and navigation at NASA before joining APD in 2021, also wasn't enticed by the successes of the Apollo missions. The pictures of those missions were full of men in white shirts, skinny black ties and crew cuts.

"I wish I could say I had a dream of working for NASA from a young child, however I never identified with it," she said. "I was like, 'I'll be a teacher.' That's what I saw that smart women were doing. In a class picture from that time, I can be seen wearing almost a 'mini-me' dress of my teacher — It's kind of what you see and what you think is a vision of the future."

Barclay credits her eventual interest in engineering to a combination of excelling at math and science and the rising equity in sports from Title IX policies — "I think just being involved in sports, you get a better appreciation for Newton's laws of physics when you're trying to hit or kick or bat something," she said. "I played soccer for a boys club that became a youth club, and it felt good that that's now for all of us."

And Tracy Felton-Robinson, APD program business manager, was drawn to NASA by a high school internship almost 30 years ago, after a visit by NASA leaders to interview her senior class. "I already had an interest in NASA, however, shortly after being on the job, I fell in love with NASA," she said.

Felton-Robinson explored several career opportunities at the center, from procurement to security, before finding her calling in resources. She has since worked on such projects as the Hubble Space Telescope, the Laser Interferometer Space Antenna, the Solar Terrestrial Relations Observatory (STEREO), and Explorations and Space Communication in addition to APD.

Their diverse paths led to winding routes through Goddard. "I find my problem at Goddard is that there are so many cool jobs that I would like to do them all," said Grofic, who worked in software, systems engineering and project and program management for both Earth Science and Astrophysics Programs during her more than 40 years at NASA. Today, as the leadership of APD at Goddard, the managers want to inspire others to follow in their footsteps.

"I hope seeing women in leadership positions will influence and inspire other women at Goddard," said Felton-Robinson, noting that both of her Deputy Program Business Managers are also women. "When I first started, the leadership at NASA was male-dominated from what I observed. Now that we have more women in leadership positions, that shows we can do whatever we set their minds to, and everything is achievable."

Policies at Goddard and in APD that strive for inclusivity and diversity have played a role in women's advancement in the sciences, Barclay noted, citing techniques like double blind studies for selecting proposals and announcements.

"We're finally coming closer to where I don't do that counting as much as I used to," she said. "It's a pleasant surprise that that's the case."

Members of the Hubble team gather with Associate Administrator for the Science Mission Directorate, Dr. Thomas Zurbuchen, and Goddard Center Director Dennis Andrucyk on August 18, 2021, during a visit to thank the recovery team that analyzed the problem resulting in the loss of Hubble's payload computer and performed the subsequent spacecraft side switch to compensate for it. CREDIT: NASA

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Science Mission Directorate (SMD)

ASTROPHYSICS DIVISIONS

GSFC ASTROPHYSICS DIVISION (APD CODE 440

COSMIC ORIGINS (COR)

How did we get here?

Cosmic Origins' (COR) scope includes such topics as stellar lifecycles and the evolution of the elements, early formation and evolution of planetary systems, archaeology of the Milky Way and its neighbors, the history and evolution of galaxies and supermassive black holes, and the universe's first light and age of reionization — a period when radiation from the first stars ionized the universe's cool hydrogen gas, allowing it to become transparent to ultraviolet light. The Cosmic Origins program includes telescopes — from the Hubble Space Telescope to the soon-to-be-launched James Webb Space Telescope — that operate across much of the electromagnetic spectrum, providing a treasure trove of complementary research and helping to paint a comprehensive portrait of the universe.

PHYSICS OF THE COSMOS (PCOS)

How does our universe work?

Physics of the Cosmos (PCOS) lies at the intersection of physics and astronomy. It explores some of the most fundamental questions regarding the physical forces and laws of the universe: the validity of Einstein's General Theory of Relativity and the nature of spacetime, the behavior of matter and energy in extreme environments, the cosmological parameters governing inflation and the evolution of the universe, and the nature of dark matter and dark energy.

In addition to PCOS and COR science, the program includes:

The Hubble Space Telescope

NASA's groundbreaking space-based observatory is one of the many missions under the APD tent and one of its longest-running successes at over three decades in orbit.

Space Science Mission Operations (SSMO)

Manages heliophysics, astrophysics, and planetary science missions operations and takes part in concept development, ground system development, integration and testing, and operations readiness.

JPL

EXOPLANET EXPLORATION

Are we alone?

The Exoplanet Exploration program focuses on the search for habitable planets and life beyond our solar system. Among the questions it seeks to answer are: What kinds of planetary systems orbit other stars in our galaxy? How common are solar systems like our own? What are exoplanets like? Are we alone? The primary goals of these explorations are to take a census of planetary systems in our galaxy, characterize the diversity of other worlds, and search for solar systems like ours. Ultimately, the program aims to discover and characterize Earth-like planets around our nearest neighbors, search for habitable conditions on those planets, and uncover signatures of life.

The science results from the entire portfolio of astrophysics missions developed across the agency helps plan for next era missions.

CURRENT

Fermi Gamma-ray Space Telescope

Fermi observes the cosmos using the highest-energy form of light and maps the entire sky every three hours. Fermi helps investigate some of the most extreme phenomena of the universe, including gamma-ray bursts, black-hole jets, pulsars, supernova remnants, and the origin of cosmic rays.

Hubble Space Telescope

Launched in 1990, Hubble has made more than 1.4 million observations over the course of its lifetime, changing the face of astronomy. Five servicing missions kept the telescope scientifically and technologically advanced over the course of its history and it continues to produce revelations about the cosmos.

Neil Gehrels Swift Observatory

The Swift observatory comprises three optical and x-ray telescopes, which work in tandem to provide rapid identification and multi-wavelength follow-up of gamma-ray bursts and their afterglows.

Spectrum-Roentgen-Gamma (SRG)

This Russian-German high-energy astrophysics mission launched in 2019 and began the first of eight planned sky surveys. After four years of operations in scanning mode, building all-sky maps, the observatory shifts to pointed observations at specific targets of interest. The mission occasionally appears as "Spectrum X-Gamma" (SXG) in English.

Transiting Exoplanet Survey Satellite (TESS)

TESS surveys hundreds of thousands of the brightest stars near the Sun to search for transiting exoplanets. TESS covers a sky area 400 times larger than that previously monitored by the Kepler Space Telescope.

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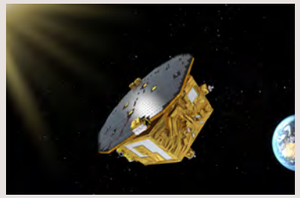
FUTURE

Advanced Telescope for High-ENergy Astrophysics (Athena)

An X-ray telescope designed to study the hot and energetic universe and planned for launch in the 2030s, Athena will address key questions that include: How and why does ordinary matter assemble into the galaxies and galactic clusters, and how do black holes grow and influence their surroundings.

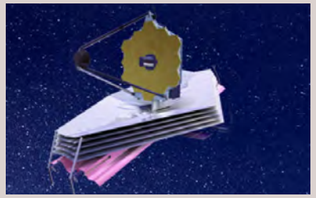
Laser Interferometer Space Antenna (LISA)



This gravitational-wave observatory scheduled to launch in the early 2030s is led by the European Space Agency with major contributions from NASA. The mission will use three spacecraft separated by millions of miles to detect the signatures of gravitational waves generated by distortions of spacetime.

Decadal Survey Missions

APD is responsible for providing input and analysis associated with Decadal Studies. Recent studies identified the need for flagships such as:



James Webb Space Telescope

Launching in 2021, the infrared observatory will complement and extend the discoveries of the Hubble Space Telescope with longer wavelength coverage and improved sensitivity. Webb will look much closer to the beginning of time and hunt for the unobserved formation of the first galaxies, and look inside dust clouds where stars and planetary systems are forming today.

Nancy Grace Roman Space Telescope

Launching in the mid-2020s, this observatory is designed to explore dark energy and dark matter, search for and image exoplanets, and study many topics in infrared astrophysics. It has a 2.4-meter telescope, the same size as Hubble's, but with a view 100 times greater than Hubble.

As other organizations at GSFC manage the implementation of these flagships, APD awaits the ASTRO 2020 Decadal Study report and will factor in planning activities to aid the next flagship and/or probes identified in the study. ■

Tracy Vogel / Code 440
Astrophysics Projects Division Technical Writer

FPD

Project Support Community Spotlight

The Project Support Community Spotlight seeks to recognize and connect members of the project support community across the Flight Projects Directorate. Additionally, resources and relevant information will be highlighted in each Critical Path publication. The Critical Path team looks forward to connecting with and highlighting the project support community.

How can we support you?

Contact FPD Project Support website for general information.

- Admin Space Station (AdSS) for Goddard Space Flight Center (GSFC) https://fpdsp13.gsfc.nasa.gov/sites/100/SitePages/Admin_Portal.aspx
- Flight Projects Directorate Project Support https://fpd400.gsfc.nasa.gov/sites/400/FPD_Internal/SitePages/ProjectSupport.aspx
- jacqueline.seymore@nasa.gov
- (301) 286-6307
- sarah.a.harnish@nasa.gov
- (301) 286-6567

Susan Wright

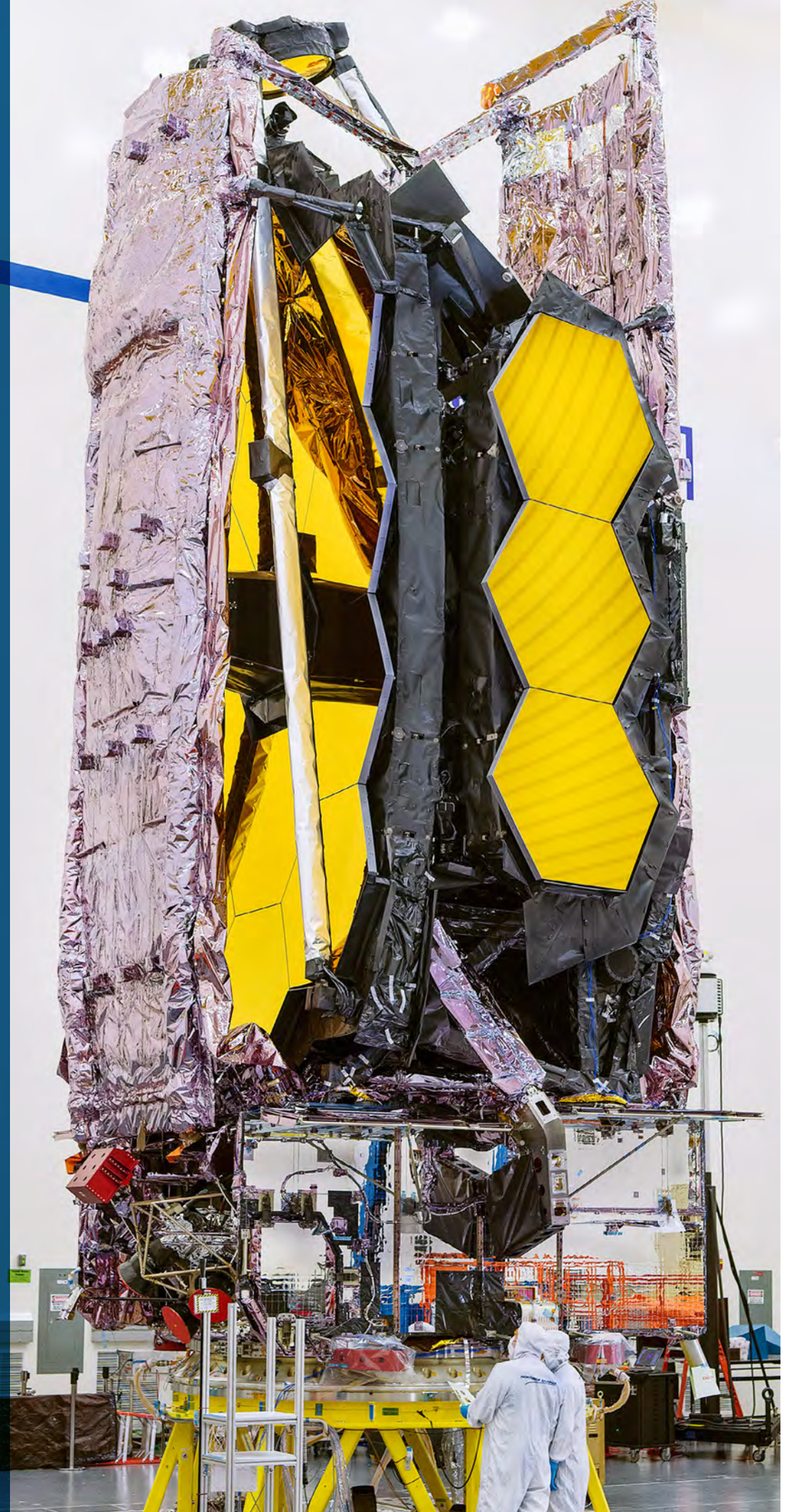
Astrophysics Projects Division (APD)
Project Support Manager

Susan Wright first joined Goddard Space Flight Center's workforce in 1999, and has been in her current position as a secretary with the Astrophysics Projects Division office since 2010. When asked her favorite part about her role in the Goddard community, Susan says, "My favorite part about working in the Astrophysics Projects Division is the team spirit. I enjoy the social interaction with my coworkers and that's probably the thing that I miss most about the Covid-19 quarantine. We work well together as a team and that's very important to me." Outside of her role at Goddard Susan has several hobbies, including music, gardening, cooking and sewing. She also enjoys entertaining family, friends and neighbors. ■

Sarah Harnish / Code 400

James Webb Space Telescope *Has Completed Testing*

After successful completion of its final tests, the James Webb Space Telescope is being prepared for shipment to its launch site.



Fully assembled and fully tested, NASA's James Webb Space Telescope has completed its primary testing regimen and will soon begin shipment preparations. CREDIT: NASA/CHRIS GUNN

Engineering teams have completed Webb's long-spanning comprehensive testing regimen at Northrop Grumman's facilities. Webb's many tests and checkpoints were designed to ensure that the world's most complex space science observatory will operate as designed once in space.

Now that observatory testing has concluded, shipment operations have begun. This includes all the necessary steps to prepare Webb for a safe journey through the Panama Canal to its launch location in Kourou, French Guiana, on the northeastern coast of South America. Since no more large-scale testing is required, Webb's clean room technicians have shifted their focus from demonstrating it can survive the harsh conditions of launch and work in orbit, to making sure it will safely arrive at the launch pad. Webb's contamination control technicians, transport engineers, and logistics task forces are all expertly prepared to handle the unique task of getting Webb to the launch site. Shipping preparations will be completed in September.

Webb Will Soon Be on its Way

"NASA's James Webb Space Telescope has reached a major turning point on its path toward launch with the completion of final observatory integration and testing," said Gregory L. Robinson, Webb's program director at NASA Headquarters in Washington. "We have a tremendously dedicated workforce who brought us to the finish line, and we are very excited to see that Webb is ready for launch and will soon be on that science journey."

While shipment operations are underway, teams located in Webb's Mission Operations Center (MOC) at the Space Telescope Science Institute (STScI) in Baltimore will continue to check and recheck the complex communications network it will use in space. Recently this network fully demonstrated that it is capable of seamlessly sending commands to the spacecraft. Live launch rehearsals are underway within the MOC with the explicit purpose of preparing for launch day and beyond. There is much to be done before launch, but with integration and testing formally concluded, NASA's next giant leap into the cosmic unknown will soon be underway.

Once Webb arrives in French Guiana, launch processing teams will configure the observatory for flight. This involves post-shipment checkouts to ensure the observatory hasn't been damaged during transport, carefully loading the spacecraft's propellant tanks with hydrazine fuel and nitrogen tetroxide oxidizer it will need to power its rocket thrusters to maintain its orbit, and detaching 'remove before flight' red-tag items like protective covers that keep important components safe during assembly, testing, and transport. Then engineering teams will mate the observatory to its launch vehicle, an Ariane 5 rocket provided by the European Space Agency (ESA), before it rolls out to the launch pad. Webb is an international program led by NASA with its partners, ESA and the Canadian Space Agency.

With integration and testing formally concluded for the James Webb Space Telescope, NASA's next giant leap into the cosmic unknown will soon be underway. CREDIT: NASA/CHRIS GUNN

The James Webb Space Telescope is an amazing feat of human ingenuity, made more impressive by the obstacles Webb personnel overcame to deliver this amazing space science observatory. Earthquakes, a devastating hurricane, snowstorms, blizzards, wildfires, and a global pandemic are only some of what the people behind Webb endured to ensure success. Webb's story is one of perseverance – a mission with contributions from thousands of scientists, engineers, and other professionals from more than 14 countries and 29 states, in nine different time zones.

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"To me, launching Webb will be a significant life event – I'll be elated of course when this is successful, but it will also be a time of deep personal introspection. Twenty years of my life will all come down to that moment," said Mark Voyton, Webb observatory integration and test manager at Goddard. "We've come a long way and worked through so much together to prepare our observatory for flight. The telescope's journey is only just beginning, but for those of us on the ground who built it, our time will soon come to an end, and we will have our opportunity to rest, knowing we put everything on the line to make sure our observatory works. The bonds we formed with each other along the way will last far into the future."

Opening NASA's New Eye on the Cosmos

After launch, Webb will undergo an action-packed six-month commissioning period. Moments after completing a 26-minute ride aboard the Ariane 5 launch vehicle, the spacecraft will separate from the rocket and its solar array will deploy automatically. After that, all subsequent deployments over the next few weeks will be initiated from ground control located at STScI.

Webb will take one month to fly to its intended orbital location in space nearly one million miles away from Earth, slowly unfolding as it goes. Sunshield deployments will begin a few days after launch, and each step can be controlled expertly from the ground, giving Webb's launch team full control to circumvent any unforeseen issues with deployment.

Once the sunshield starts to deploy, the telescope and instruments will enter shade and start to cool over time. Over the ensuing weeks, the mission team will closely monitor the observatory's cooldown, managing it with heaters to control stresses on instruments and structures. In the meantime, the secondary mirror tripod will unfold, the primary mirror will unfold, Webb's instruments will slowly power up, and thruster firings will insert the observatory into a prescribed orbit.

Once the observatory has cooled down and stabilized at its frigid operating temperature, several months of alignments to its optics and calibrations of its scientific instruments will occur. Scientific operations are expected to commence approximately six months after launch.

'Flagship' missions like Webb are generational projects. Webb was built on both the legacy and the lessons of missions before it, such as the Hubble and Spitzer space telescopes, and it will in turn provide the foundation upon which future large astronomical space observatories may one day be developed.

"After completing the final steps of the James Webb Space Telescope's testing regimen, I can't help but see the reflections of the thousands of individuals who have dedicated so much of their lives to Webb, every time I look at that beautiful gold mirror," said Bill Ochs, Webb project manager for NASA Goddard.

The James Webb Space Telescope will be the world's premier space science observatory when it launches in 2021. Webb will solve mysteries in our solar system, look beyond to distant worlds around other stars, and probe the mysterious structures and origins of our universe and our place in it.

Thaddeus Cesari / Code 443
JWST Technical Writer

Watch the video

Social Media Short: NASA's James Webb Space Telescope Completes Testing

https://youtu.be/oaO08UZI5ew

FOCUS ON FACILITIES

OSAM-1 MOC B.28

The recent completion of the Mission Operations Center (MOC) for On-orbit Servicing, Assembly, and Manufacturing 1 (OSAM-1) in Building 28 can be appreciated as an example of directorates working together to meet the challenges of developing new space for mission success. With a new facility needed, early discussions between Codes 400 and 500 explored limited possibilities, ultimately settling upon repurposing a dormant computer room that was being under-utilized for storage that required significant investment to bring up to code and correct myriad technical and physical deficiencies. Building 28, Room N210 (and supporting space N281) was once the location of the Cave Virtual Reality Simulator and home to several Flight Dynamics Facility (FDF) servers. The space, approximately 2600 square feet, was designed to accommodate 53 consoles. It was a win-win for both directorates!

The then Satellite Servicing Project Division (now the Exploration and In-Space Services Projects Division – ExIS) and OSAM-1 project funded the construction. Code 500 undertook the cost to remove and store the Cave while also searching for a new home for it. At the end of OSAM-1 use, the upgraded facility will revert to direct ownership by Code 500 for their future use. A memorandum of understanding defines the terms and operational agreements between Codes 400 and 500.

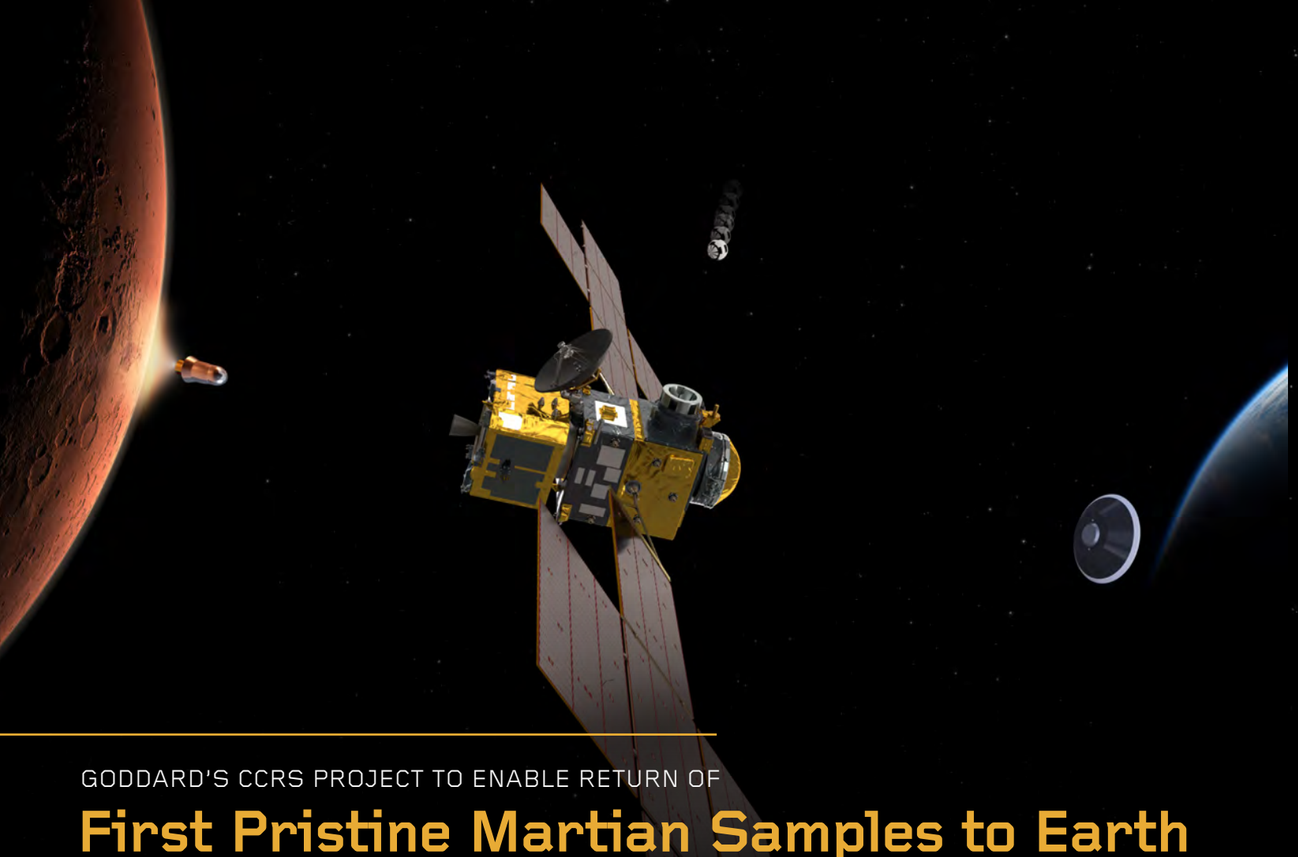
Soon after construction began in the fall of 2019, Goddard's COVID-19 Stage 3 response stopped the project in early 2020. But Code 224, working closely with the customer stakeholder organizations in Codes 400 and 500, prepared a formal restart package. The business case was deemed to be sound by Goddard's senior management, which allowed the work to resume in late spring of 2020.

The project presented a host of complex challenges, both from a technical standpoint during the planning and design phases, as well as physical difficulties that surfaced during the construction phase. Because of the different levels of security between the stakeholder organizations, physically separating the new OSAM-1 MOC from the adjoining FDF server room and adjoining FDF MOC presented the first challenge. New construction in addition to security measures added to existing construction were required to separate the spaces from each other, all while maintaining FDF's operational status. In addition to adding new separate uninterruptible power supply systems, the two organizations required that their electrical service be segregated as well, so that each organization would not be subjected to the operational status of the other. During design, the team identified all power sources feeding the FDF server room and planned the proper sequencing to take each source down and successfully reroute it during the construction phase. This meant planning, arranging for, and executing more than 36 outages while working around FDF's demanding mission operations schedule and keeping their server room operational.

Another project requirement was to segregate the heating, ventilation and air conditioning (HVAC) service to the spaces because of their different operating environment requirements related to temperature and humidity. While the FDF server room was better served by new CRAC units, this type of air delivery system would not be conducive for the OSAM-1 space, which would be occupied by personnel 24/7. The team planned the removal of the existing computer room air conditioning (CRAC) units that served the entire area and found space for new CRAC units in the newly separated FDF server room, before adding the OSAM-1 MOC to the building's HVAC system.

A contributing factor to the success of this project was the full and active participation of the stakeholder organizations and the consistent and accurate flow of communication facilitated by Code 224's design and execution team. ■

Bill Glenn / Code 400
Mission Support Manager



GODDARD'S CCRS PROJECT TO ENABLE RETURN OF

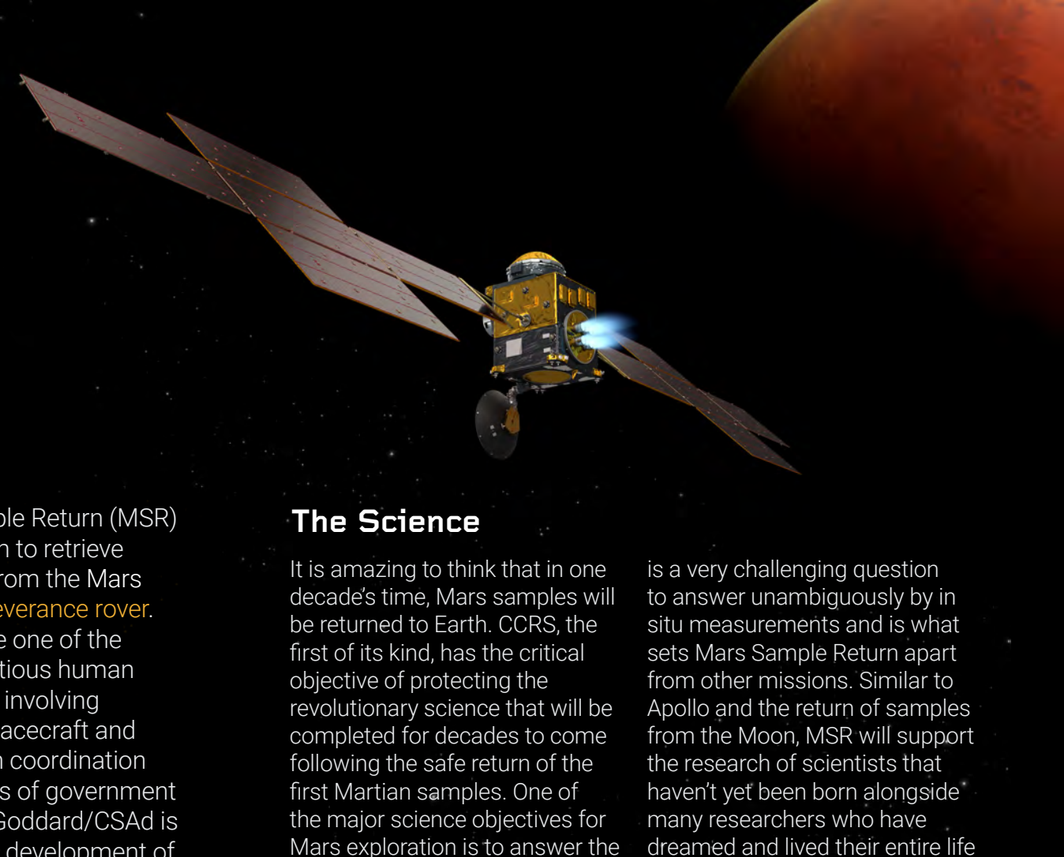
First Pristine Martian Samples to Earth

Mars Sample Return (MSR) is the robotic science mission the Mars community has been building toward for decades. Currently one of only two Agency-level flagship missions, MSR spans two programs at NASA Headquarters and is part of a larger campaign including significant European Space Agency (ESA) contributions.

The MSR campaign is extremely complex with a number of components set to complete a series of space exploration firsts, requiring organizational diversity to align with core competencies and experience across NASA centers to enable its success. The campaign has also set an aggressive schedule requiring impeccable timing by all program elements. By assigning the **Capture/ Containment and Return System (CCRS)** project to Goddard Space Flight Center (Goddard), NASA Headquarters acknowledges Goddard's many organizational and project management successes. Goddard's strengths will be critical to successfully implement and coordinate the immense number of interfaces required given the collaboration and engagement across NASA centers and with ESA.

CCRS is a payload on the Earth Return Orbiter (ERO) spacecraft being provided by ESA. CCRS is critical to MSR efforts to enable the first Mars sample to be safely returned to Earth. First, it supports the rendezvous and capture of the Orbiting Sample container being produced by NASA's Jet Propulsion Laboratory (JPL) with ESA's ERO. Its immense in-flight robotic assembly will implement all "breaking the chain" of contact with Mars and containment-assurance activities.

The Earth Return Orbiter will return Mars samples collected by two other NASA missions back to Earth. CREDIT: ESA/ATG MEDIALAB



Mars Sample Return (MSR) is a mission to retrieve the cores from the Mars 2020 Perseverance rover. MSR will be one of the most ambitious human endeavors, involving multiple spacecraft and launches in coordination with dozens of government agencies. Goddard/CSAd is leading the development of the Capture/Containment and Return System (CCRS).

The Science

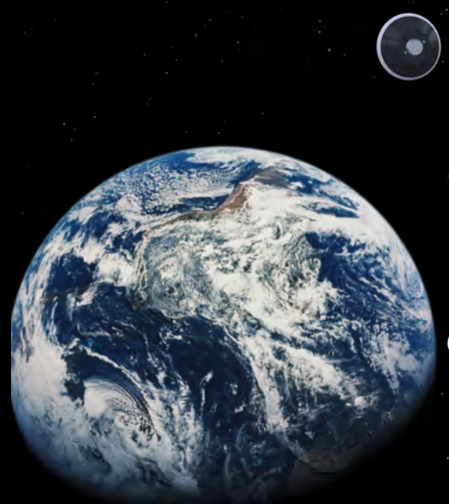
It is amazing to think that in one decade's time, Mars samples will be returned to Earth. CCRS, the first of its kind, has the critical objective of protecting the revolutionary science that will be completed for decades to come following the safe return of the first Martian samples. One of the major science objectives for Mars exploration is to answer the question about whether or not life originated beyond Earth. This is a very challenging question to answer unambiguously by in situ measurements and is what sets Mars Sample Return apart from other missions. Similar to Apollo and the return of samples from the Moon, MSR will support the research of scientists that haven't yet been born alongside many researchers who have dreamed and lived their entire life in support of Mars exploration.

Goddard Missions / Elements Contributing Foundational Technology

- OSIRIS-REx
- NExIS and its OSAM-1 mission
- MUSTANG Electronics
- PACE and its primary instrument, OCI

Goddard's CCRS Mission Partners

- European Space Agency
- Jet Propulsion Laboratory
- Langley Research Center
- Ames Research Center



(above) Artist's impression of ESA's Earth Return Orbiter. (below) Artist's impression of ESA's Mars sample container over Earth. CREDIT: ESA/ATG MEDIALAB

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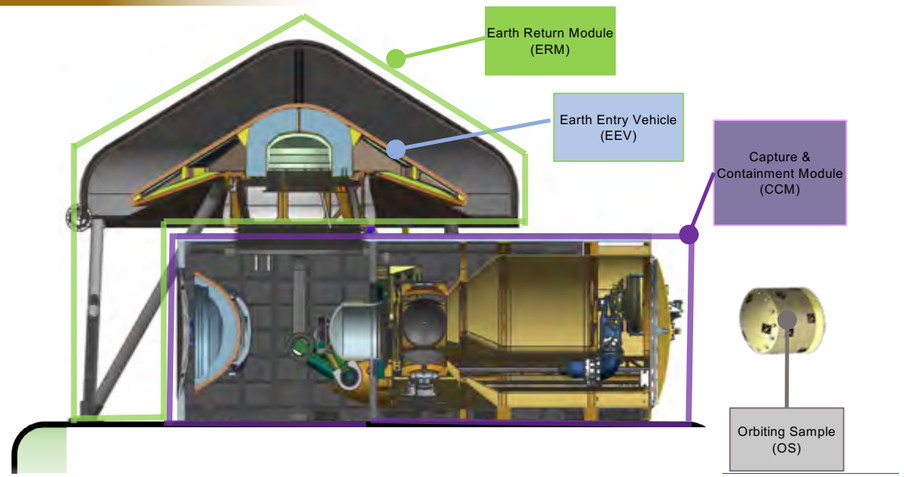
Earth Return Orbiter (ERO)



"Breaking the chain" refers to the critical efforts required to simultaneously protect the samples and ensure the utmost protection to Earth from any Martian biology that may exist on the samples returned from the Red Planet for the first time in history. These efforts are similar to the planetary protections that have been taken for decades to ensure that all rovers, landers, and orbiters sent to Mars were/are free of Earth viable biological material but in the reverse direction. CCRS will encapsulate the samples in a safe envelope and sterilize that envelope so that it can be returned to Earth.

CCRS Elements

Capture Containment Module (CCM)

- Captures, constrains, and orients the orbiting sample
- Contains the orbiting sample
- Transfers the contained Orbiting Sample container to the CCRS clean zone
- Performs Earth entry system in-flight assembly and CCM closeout
- Maintains clean zone integrity

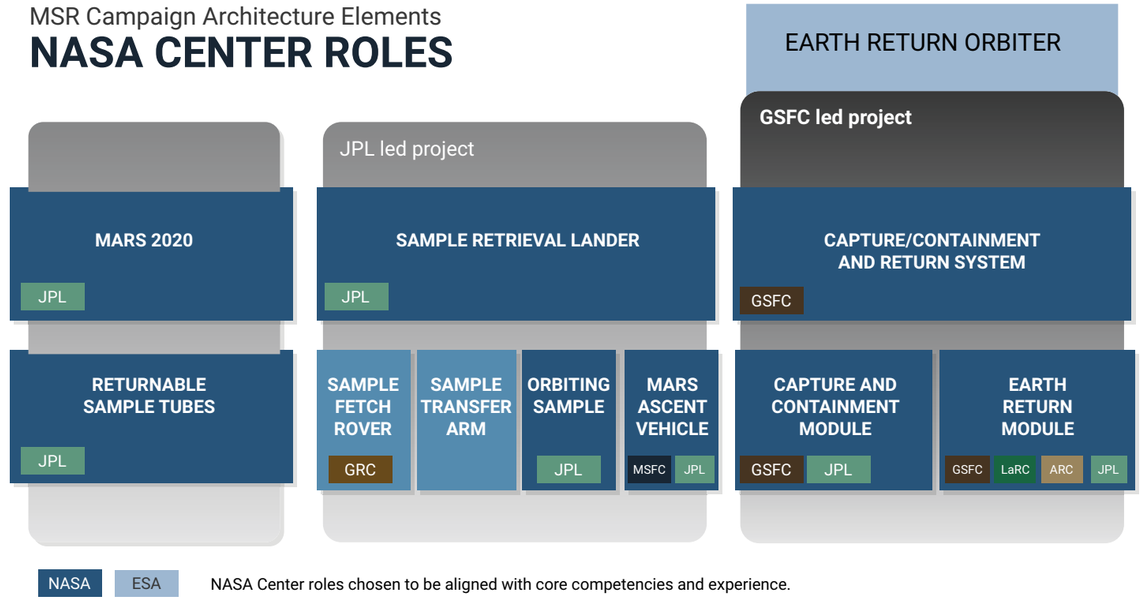
Earth Return Module

- Protects the Earth Entry System (EES) from micrometeoroid orbital debris
- Precision separation of the EES from the ERO
- Delivery of the EES to the Utah Test and Training Range in support of a safe landing

CCRS also includes all avionics and power, flight software, and ground data systems.

MSR Campaign Architecture Elements

NASA CENTER ROLES



NASA Center roles chosen to be aligned with core competencies and experience.

For MSR and CCRS, NASA will partner with, at minimum, an unprecedented 19 different U.S. government departments and agencies, including the U.S. Centers for Disease Control and Prevention and the U.S. Department of Homeland Security, as well as ESA, to safely return the samples to Earth.

CCRS provides an outstanding opportunity for Goddard to continue to prove and build its planetary portfolio for future work. This gateway mission builds upon a number of Goddard strengths and expands Center diversity as the Agency had previously focused the majority of its planetary flagship missions to other NASA centers. Goddard is providing CCRS project management, systems engineering, safety and mission assurance, integration and test, spacecraft post-delivery support, sample science integrity and protection, and operations, while managing the contributions from its contributing NASA centers.

CCRS recently completed its system requirements review with a pre-ship review targeted for the Fall of 2025 to support the 2026 ERO launch. Aside from all project lifecycle reviews, all key decision points are held at the program level at JPL and NASA Headquarters. The CCRS team is currently in the midst of several huge endeavors including prototype development, maturing design for its upcoming Spring 2022 preliminary design review, procuring long-lead hardware, and developing and distributing several critical requests for proposal. Goddard is primed and positioned to support the project's intense schedule, made even more critical given the finite planetary windows necessary to support the first launch from another planet and the orbit required for rendezvous with the samples.

Unlike most flight projects whose requirements are focused on specific scientific measurements and objectives, MSR, and in support CCRS, are based on very different types of requirements. CCRS specifically, is extremely challenging given the number of unknowns that it is designing to. Research has been limited regarding Martian biology and its properties, yet CCRS must sterilize the container while ensuring the biological safety of the samples. The project's engineers are working diligently to study and identify the appropriate method for sterilization while preserving the integrity of the fragile samples for future scientists on Earth to analyze them with laboratory

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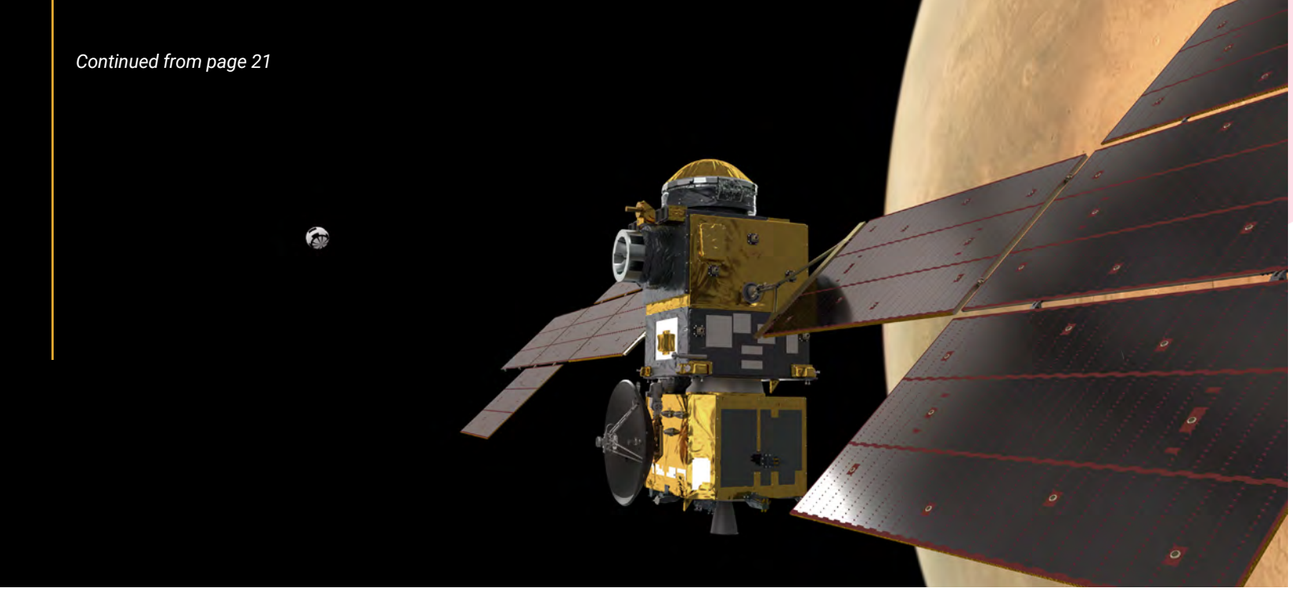

Artist's impression of ESA's Earth Return Orbiter over Mars approaching Mars sample container. CREDIT: ESA

techniques—some not yet invented. CCRS technologies will also provide the foundation for other future planetary exploration missions to other potentially habitable worlds such as Europa and Enceladus. The team is working towards the general guidance that has been provided regarding planetary protection, managing the evolving requirements given there is no standard planetary protection regulatory body. CCRS continues to support the development of the project's technical requirements while balancing the needs of all Agency-level cost and schedule requirements that integrate across MSR.

Additionally, CCRS is unable to utilize many proven testing paradigms, requiring waivers from well-known "test-as-you-fly" procedures. As an orbiting cleanroom, many of the technical components have never been utilized in this environment with limited ways to test within a full end-to-end paradigm. The team is developing a series of cameras and other verification checkpoints that will be utilized to monitor all automated CCRS activities and inspect the ERM for damage once separated from the CCM. Thankfully, Goddard's experience provides the project the best chance for success with an inherent degree of careful engineering to ensure all science is protected.

CCRS and its project management team is overseeing the development of JPL's new brazing technology (in short, melting a metal alloy into a liquid that essentially glues metal together to seal the sample container and sterilize the seal) as a potential sterilization option as well as providing engineering developments for thermal protection for the ERM and ballistic reentry landing in Utah with no parachute.

CCRS is on a clear path to success with the support of Goddard and the Directorate. Engagement and enthusiasm from all Goddard team members provide an additional vital footing as its Goddard project team and stakeholders work to complete this exciting and challenging mission. ■

Rachel Brinson / Code 400
Senior Technical Writer

> "NASA scientists, as well as scientists around the world, are over the moon(s of Mars) excited to get this sample back and to dive in to the outstanding findings and research that are awaiting the next generations."
>
> **Jason Dworkin**

2020 ROBERT H. GODDARD AWARD RECIPIENTS

Please utilize the following link to view the Center-published 2020 Robert H. Goddard Awards recipients. Thank you to our nominators and nominees for their work recognizing our teams and individuals and congratulations to our winners for their exceptional achievements. Digital certificates are being disseminated.

2020 RHG AWARD RECIPIENTS

2021 Code 400 FPD Peer Awards & Achievements

This year's FPDFest was widely attended and received great feedback. As the second virtual FPDFest, this year, the event was held live via Teams versus last year's recording. The event had extensive engagement through the Teams chat and icon features with applause that virtually mimicked what we had come to expect at our previous in-person events. Additionally, the event included presentation of the Flight Projects Peer Awards by FPD management and, as a new feature, several of our Associate Division Directors. Each winner was recognized and commended with a brief summary of their outstanding contributions. The entire event was condensed into one hour and ten door prizes were presented with selection using a fun, name generating tool. Thank you to all who participated via the nominations process, award selections, FPDFest committee and presenters, and all of our attendees for their engagement that contributed to the event making it a smashing success.

Silo Slammer

The recipient of this award exemplifies a commitment to openly collaborate, share ideas, and respond to needs beyond their own organization to achieve a successful team solution.

2021 PEER AWARD FOR EXCELLENCE IS AWARDED TO

Arlin Bartels
Robert Lambeck
Melissa Meyers
Dereck Robinson

Inclusion Fusion

The recipient of this award exhibits an exceptional ability to bring together varying skill levels, experiences, and backgrounds to foster an environment where all individuals can contribute fully and are valued, engaged and supported to reach their full potential.

2021 PEER AWARD FOR EXCELLENCE IS AWARDED TO

Elizabeth Forsbacka

Rookie of the Year

This award recognizes and distinguishes an employee who has demonstrated agility by getting up to speed quickly in assuming their new responsibilities as they transitioned to their new duties in a new position.

2021 PEER AWARD FOR EXCELLENCE IS AWARDED TO

Molly Jackson
Corina Koca
Ryan Lumsden
Julia Owens

Continued on page 26

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This award exemplifies a person who has a really big, demanding, seemingly impossible job, yet they manage to successfully keep all the "balls in the air." This awardee is someone who does more with less and develops new and creative ways of approaching their work.

2021 PEER AWARD FOR EXCELLENCE IS AWARDED TO

Rebecca Besser
Valerie Dixon
Vicki Dulski
Christopher Mishaga
David Parker

This award recognizes an FPD team member whose unique actions further the FPD's objectives and best reflect the important values of the Center: Safety, Integrity, Teamwork, and Excellence.

2021 PEER AWARD FOR EXCELLENCE IS AWARDED TO

Jessica Hamill
David Watson
Jason Wisniewski
Dr. Qi Yao

This award recognizes a person who demonstrates effective and decisive leadership qualities, an ability to advance their teams' project amidst adversity and does so in a seemingly effortless manner.

2021 PEER AWARD FOR EXCELLENCE IS AWARDED TO

Brian Clemons
Keisha Dominguez
Robert Gallagher
Todd King
Chris Reith
Gary Won

This award recognizes an employee who has exhibited dedication to their job from behind the scenes with a can-do attitude, a willingness to support the Directorate, and a commitment to meet the needs of customers and co-workers.

2021 PEER AWARD FOR EXCELLENCE IS AWARDED TO

Raymond Baldwin
Joseph Cavaluzzi
Julie Hoover
Jason Houston
Valerie Potter
Mark Wagner
Lourdes Wisniewski

The recipient of this award recognizes an employee who embraces mentoring and actively participates in the development of others. This awardee seeks to positively influence an individuals' career development by actively encouraging and guiding mentees in developing and achieving career goals.

2021 PEER AWARD FOR EXCELLENCE IS AWARDED TO

Gregory Frazier
Joseph Krygiel
Frederick Lim
Vanessa Lloyd
Christopher Lynnes

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Boundless Energy

The recipient of this award recognizes an employee who goes above and beyond their regular assignment. Characteristics of this person include: volunteering for extra committees, mentoring, outreach activities, or going the extra mile to help others.

2021 PEER AWARD FOR EXCELLENCE IS AWARDED TO

Zachary Gonnsen
Faiza Hartnett
Adam Matuszeski
Theresa Thomas

Steady Helm

This award exemplifies a person who has a special ability to keep the team focused on a crisis, keep things moving, perform well under pressure, and reinforce good morale and respect for all team members during times of stress and adversity.

2021 PEER AWARD FOR EXCELLENCE IS AWARDED TO

Delaney Burkart
Elizabeth Corderman
Michael Grotenhuis
Jason Hylan
Joseph Knuble
Kurt Leonard
Arthur Whipple

WHAT'S UP WITH OUR Flight Projects Development Program?

COHORT 4

Our Flight Projects Development Program (FPDP) Cohort 4 had an incredibly busy spring as they reached the mid-point of their two-year accelerated development program. All our FPDP participants had a review with the FPDP Governance Board, completed their first-year assignment, and have been given their second-year assignment. The summer months bring transitioning to their new positions, completing the program curriculum, and working on their Capstone project, which will be presented in spring of 2022 prior to graduation. ■

Donna Swann / Code 400
FPD Assistant Director
FPDP Program Manager

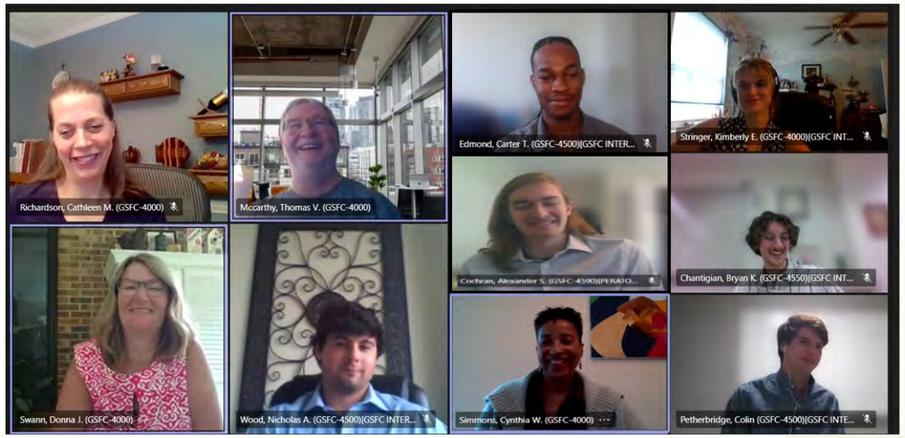
Our cohort 4 participants are assigned to a diverse portfolio of critical missions for their second assignments. CREDIT: NASA

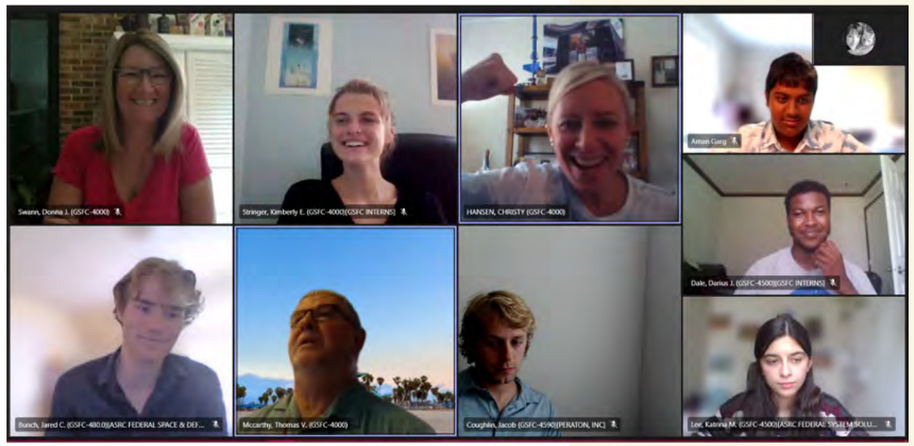
For more information about the FPDP, please look for an overview on the FPD hub, or contact Donna Swann at: donna.j.swann@nasa.gov

The Flight Projects Directorate sponsored more than 55 interns in the spring and summer of 2021. The interns worked on remarkable projects from home, thanks to mentors across numerous organizations, while still connecting with others, and participating in networking events.

Let's CONNECT with Interns

Two Let's CONNECT sessions brought together FPD's senior leaders and FPD interns, which is especially important in our virtual environment. In both sessions, the interns discussed their career aspirations and asked thought-provoking questions. Our senior leaders enjoyed sharing their own personal stories and giving education and career guidance. ■





Tom McCarthy (Director), Cynthia Simmons (Deputy Director), Cathy Richardson (Deputy Director of Planning & Business Management), Christy Hansen (Chief of Staff), and Donna Swann (Assistant Director for FPD) enjoyed the time they spent with FPD's summer interns during two Let's CONNECT sessions. CREDIT: NASA

MISSIONS
Growing Careers and Mission Success

Flight Projects Diversity & Inclusion Committee

Intern Panel on Imposter Syndrome

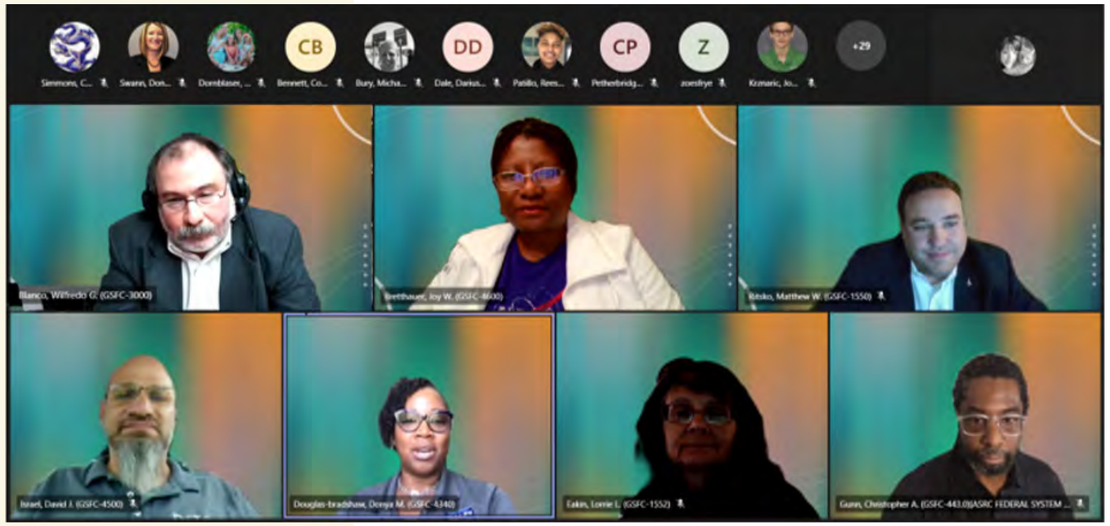
FP D&I: Launching Missions: Growing Careers and Mission Success

On July 28, the Flight Projects Diversity & Inclusion Committee (FP D&I) hosted a panel, *Launching Missions: Growing Careers and Mission Success*, which focused on Imposter Syndrome, for interns across Goddard. Imposter syndrome is loosely defined as doubting your abilities and feeling like a fraud. It disproportionately affects high-achieving people, who find it difficult to accept their accomplishments.

The panel was composed of a diverse set of Agency leaders, including men and women in key positions across flight projects, who shared their experiences. Each member discussed their career path and gave excellent advice on topics such as making connections, embracing change, and taking risks. They shared personal moments of doubt and fear, what resources helped them overcome those situations and ultimately helped mold them into the leaders they are today. The summer interns were then given an opportunity to ask questions and the panel provided great advice, which will definitely help the interns navigate their work/life journey.

Thank you, mentors, for all you do! We wish the interns a successful year at college! ■

Shannon Smith / Code 400
Jonathan Dornblaser / Code 450



(top row, left to right) Wilfredo Blanco/300, SMA Associate Director for Risk Management & Independent Reviews, Joy Bretthauer/460, IXPE Mission Manager, Matt Ritsko/155 (moderator of the discussion), Deputy Chief – Office of the Chief Financial Officer Program and Project Resources Management Office, (bottom row, left to right) David Israel/450, LCRD Principal Investigator & ESC Lead Architect, Donya Douglas-Bradshaw/434, Lucy Project Manager, Lorrie Eakin/155.2, L9 Deputy Project Manager for Resources, Chris Gunn/443, JWST Lead Technical Photographer CREDIT: NASA

A SUMMER WITH SCAN

NASA INTERNS POWER THE FUTURE OF SPACE COMMUNICATIONS AND NAVIGATION

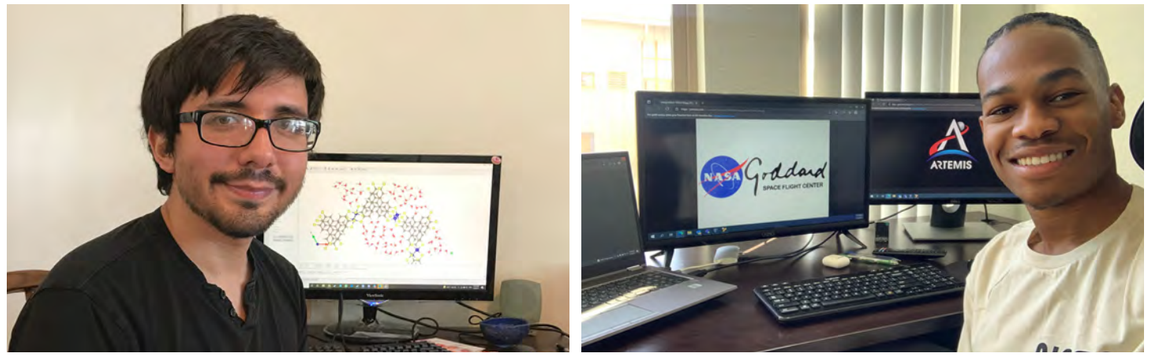
This summer, communications and navigation interns at NASA's Goddard Space Flight Center dedicated their time, talent, and fresh perspectives to innovative projects. Within the Exploration and Space Communications (ESC) projects division, code 450, 41 interns advanced the agency's capabilities in service to science and exploration.

The Space Communications and Navigation (SCaN) program at NASA Headquarters in Washington oversees NASA's communications and navigation infrastructure and technology development portfolio while simultaneously developing the future workforce. The crown jewel of SCaN's workforce development is the SCaN Internship Project (SIP), which connects students with NASA mentors to perform work of real benefit to the agency.

SIP projects encompassed a variety of disciplines, including optical and quantum communications, lunar navigation, cybersecurity, networking, systems and software engineering, and much more. Students were selected out of thousands of applicants to contribute to real-world NASA projects, working alongside their mentors and project teams to complete tangible deliverables. At the end of the summer, students presented their accomplishments to Goddard, SCaN, and ESC leadership. The students showcased how their efforts directly contributed to agency initiatives like the Artemis program.

Due to the COVID-19 pandemic, SIP summer interns across the country worked virtually toward their goals. Although located at home, interns supported Goddard's Greenbelt campus as well two other Goddard-managed facilities: the White Sands Complex in Las Cruces, New Mexico, and Wallops Flight Facility on Wallops Island, Virginia.

To create a vibrant experience for interns and mentors, SIP coordinators adjusted programming for the remote environment and created opportunities for connection and professional development. To enhance the virtual summer,



2021 SCaN Interns, Eduardo Medina (Left) and Edmond Carter (Right) at their work desks. CREDIT: NASA

interns were divided into smaller cohorts of students loosely based on education level and project area. These cohorts — named after some of the brightest stars in the night sky — attended many of the summer's activities together and relied on one another for support during their summer experience. Though SIP looked different during the pandemic, interns still had opportunities for team engagement and interpersonal growth.

In addition to their main summer project, SIP offered interns supplementary events that enhanced their internship experience, such as professional development workshops, valuable networking opportunities, and events that foster fellowship among interns. These included resume-building workshops and activities like "Down to the Wire," where students practiced communication skills in a simulated International Space Station mission control center.

SIP prides itself on lasting relationships with interns. The 2021 SIP cohort saw seven interns of 41 continuing their journeys with NASA. Some continued work on long-term projects with their mentors, while others embraced new projects, expanding their impact and growing their knowledge. Many SIP interns go on to become NASA employees, continuing their contributions to agency objectives as civil servants or contractors. All students can count on SCaN and Goddard to play a role in their careers outside their internships through the relationships and skills they develop during their tenure here.

Summer 2021 SIP interns rose to the challenge of the virtual workplace, delivering powerful innovations that support SCaN's strategic goals and ESC projects. With their mentors, interns have made meaningful contributions to agency initiatives across a wide variety of disciplines.

Looking forward, some students will continue on as fall interns. Some will join the NASA workforce as civil servants or contractors. Others will move into industry or academia, evangelizing SCaN's mission outside the agency.

All have left their mark on NASA. ■

Katie Schauer / Code 450
Technical Writer, Exploration and Space Communications

KNOWLEDGE MANAGEMENT *Insights*

Knowledge Transfer Between Projects

At its core, Knowledge Management (KM) is about connecting people through conversations and collecting and organizing content for access. Both methods are complementary and work in parallel.

Conversation enables *tacit knowledge* sharing which is gained through experience yet may not be possible to write down in its entirety. Conversations are a richer medium than content. Unless people can question and interrogate knowledge, it will not be as impactful. Content collection is focused on *explicit knowledge* which is recorded in records, diagrams, papers, and videos. More people can be reached through content over longer time. In short, knowledge is transferred *effectively through* conversations and *efficiently through content*[1].

Knowledge transfer benefits

- Connecting with people
- Learning from experience
- Improved access to documents
- Standardization
- Continuous improvement
- Maintaining capabilities over time

Project to project knowledge transfer combines the benefits of conversation and content sharing. Following are several methods to facilitate this type of session.

The **Knowledge Handover** is an effective way for one project to transfer lessons to a follow-on or similar project. The new project team benefits from the previous project's timely insights and lessons.

Process steps:

- Pre-meeting the project team documents lessons and new knowledge gained from the project.
- They co-create an agenda with potential attendees for the knowledge transfer meeting. The focus will be on *topics of most interest to the attendees*.
- During the knowledge handover, the project team gives a brief presentation, points attendees to relevant content, and emphasizes lessons learned and recommendations. This is followed by a longer question period.
- At the meeting conclusion, the new project team summarizes relevant lessons for their project and actions they will take going forward.

Example: **GOES-R Space Wx Science Products Lessons Learned shared with SWFO**

The **Pause and Learn (PaL)** is a facilitated session for project team members to reflect and learn after key milestones (key decision points / KDPs) or end of project retrospectives. It is a simple process with a low time commitment. There are no formal reports, just insights and ideas that are immediately useful.

Some features include:

- Identify local best practices
- Identify and eliminate wasted effort
- On-the-spot individual and team learning
- A team approach to problem solving
- Improved team morale
- Increased likelihood of project success

Projects have invited external teams to observe their PaL sessions. These teams could be working on an upcoming project phase, a follow-on, or similar project. When the PaL concludes, observers can engage with and ask questions of the current project team.

Examples: **JPSS-1 Integration and Testing PaL with JPSS-2 observers**
JPSS-2 PaL with SWFO-L1 observers

For a **Peer Assist** the host team is in the planning phases of a new project, program or innovation and wishes to learn from the experience of other teams (visitors). Process steps:

- Facilitator sets the ground rules of the Peer Assist – openness and generous listening from the host team as well as constructive advice and feedback from visitors.
- Host team explains the context, and lists the issues they believe they need to learn about, including options they have already considered.
- Visitors outline their past experiences and add other issues that they believe the host team would benefit from.
- Each issue is discussed through dialogue in small teams.
- Visitors summarize their advice to the host team, and the host team summarizes the actions they will take from the knowledge gained.

A **Knowledge Exchange** is the transfer of knowledge between multiple teams or diverse members of a community of practice.

Process steps:

- The group divides the topic in question into its main components.
- Dialogue sessions are held around each component, and participants share their experiences and approaches that they use. They combine their knowledge to develop a 'current best' solution based on existing knowledge, as well as identifying current knowledge gaps.
- If the components are discussed in parallel sessions, the recommended best practice is validated with the rest of the attendees.
- Documented best practices are produced and shared from the knowledge exchange.

Baton-Passing is the transfer of knowledge and lessons between a team that is tackling similar work or will be continuing the first team's work.

Process steps:

- The first team maps out the work they have just completed, as a project timeline, process flow, or mind map on a large sheet of paper.
- They identify learning points, often using sticky notes, where they have gained useful new knowledge.
- The second team uses a different color note to identify areas where they want to learn from the first team.
- The two teams discuss all the learning points.
- The second team creates an action list based on the knowledge gained.

The Project Knowledge Expo

APPEL Knowledge Services recently hosted a three-day virtual learning event organized in three tracks:

- Knowledge Management and History
- Unlock Your Strategic Mindset
- The Science of Excellence: Using Organizational Science to Enable High Performance Teams

Given the wide variety of topics, at least one session will be of interest to almost everyone. Speakers ranged from a historian to a football coach. PK Expo recordings and slides will be posted here: https://appel.nasa.gov/pk-expo/#3 ■

Judy Dickinson / Code 400
FPD Knowledge Management Lead

"The best teams engage in constructive conversation
learn, and adjust
– Scott Ta

[1]Nick Milton, *The Knowledge Manager's Handbook* (Kogan Page Ltd., 2016), 15

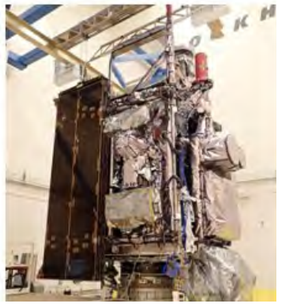
FPD Mission Updates

Roman

Roman passed their Key Decision Point (KDP)-C COVID replan review at the DPMC on May 25.

The Roman flight Tertiary Optical Mirror Assembly Structure (right) completed assembly and thermal cycling and assembly of the flight WFI Optical Bench Assembly was completed.

GOES-T



GOES-T completed mission rehearsal #2, end-to-end test #3b, followed by post-environmental comprehensive performance testing and the first countdown readiness test. NOAA announced that GOES-T will go directly into operational service after a successful launch and checkout period, replacing GOES-17 as GOES West.

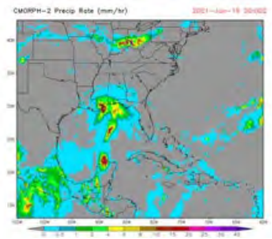
JPSS

The JPSS-2 spacecraft completed its satellite comprehensive performance test, EMI/EMC testing and thermal vacuum dry run test readiness review and the first phase of the dry run.

PACE

The PACE mechanical team completed static load and sine burst testing of the spacecraft structure.

Suomi NPP



NOAA-20 and Suomi NPP data helped to monitor the precipitation rate of Tropical Storm Claudette.

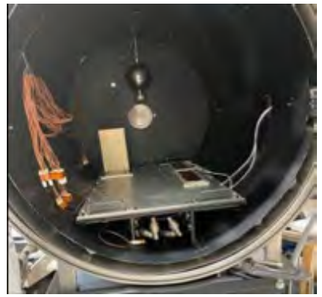
XRISM

X-ray Mirror Assembly (XMA)-1 and XMA-2 have completed performance testing and are now in calibration. Delivery to JAXA is January 2022.

LISA

LISA prototype laser shipped to Switzerland for ESA testing.

SunRISE

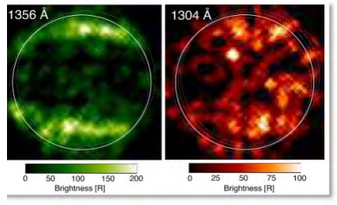


SunRISE completed the Standing Review Board and chaired the Integrated Design Review for the overall project/mission. Thermal testing of first flight solar array is underway.

SWFO-L1

SWFO-L1 completed its key decision point-B CMC/DPMC on June 10.

Hubble

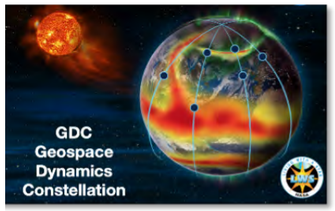


A press release was first evidence of water vapor at Jupiter's moon Ganymede.

NSN

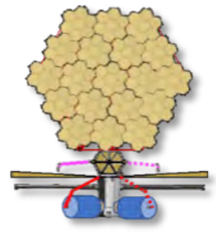
The Near Space Network (NSN) supported the launch, docking, undocking, re-entry, and splashdown of SpaceX's Cargo Dragon spacecraft.

Geospace Dynamics Constellation



The Geospace Dynamics Constellation (GDC) team completed four industry spacecraft studies and the team delivered its final reports.

NExIS's



One of NExIS's internship projects reached completion, modeling how a 20m telescope could be assembled in space.

HERMES

The Heliophysics Environmental and Radiation Measurement Experiment Suite (HERMES) Heliospace successfully completed stowed dynamics qualification testing of the Mag Boom engineering model.

ESDIS

The Earth Science Data and Information System (ESDIS) Global Imagery Browse Services (GIBS) team has been working with NOAA's Center for Satellite Applications and Research to host tiled versions of their GOES GeoColor imagery products.

Joe Hartnett

Exploration & Space Communications (ESC) (Code 450)
Project Planner / Scheduler

Born Silver Spring, MD

Education Associate of Applied Science: Business Management
Bachelor of Business Administration (in work)

Life at Goddard

In 2011, Joe began working at Goddard under the Program Analysis and Control (PAAC) contract. He supported the Networks Integration Management Office (NIMO) under the Exploration & Space Communications (ESC) projects division (Code 450). During this time, he provided project support while learning and supporting NIMO's risk management process. As time went on, Joe grew his skillset and began providing NIMO with planning and scheduling support. He was able to support the Deputy Network Director of human spaceflight with scheduling efforts before transition to a full-time scheduling position with the ground communications side of ESC.

In 2016, Joe moved on from NIMO and began supporting the Near Earth Network (NEN) as their project scheduler. Working with the NEN team, he developed integrated master schedules (IMS) for various development projects and created multiple master schedules. Working closely with management gave Joe the opportunity to develop an in-depth understanding of what data project managers find valuable. On the NEN, Joe was also able to assist with creating presentations and handled the project's monthly reporting packages.

In 2019, Joe began working the Optical to Orion (O2O) project as part of the Laser Enhanced Mission & Navigation Operational Services (LEMNOS) pipeline. Joe worked alongside a senior planner and assisted in the development of the full IMS for O2O. Shortly after starting his position with LEMNOS, Joe was able to travel to the Massachusetts Institute of Technology (MIT) Lincoln Lab and Kennedy Space Center (KSC) for scheduling support during monthly reviews and Technical Interchange Meetings (TIMs). This provided opportunities to learn the technical aspects of the project and a chance to fully grasp what lay ahead for integration and testing. Alongside his LEMNOS scheduling duties, Joe also assists ESC with the development and maintenance of their scheduling portfolio. The open communication and learning opportunities Joe has experienced with LEMNOS have been invaluable.

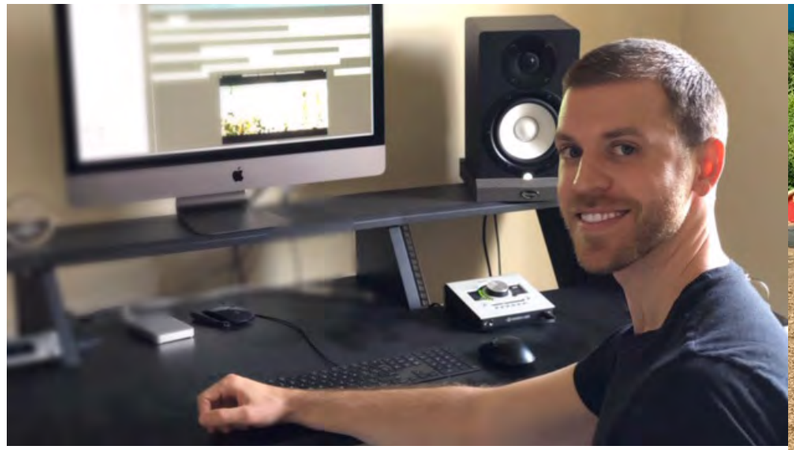
Beginning in Spring 2021, Joe also began working with the newly established Atmosphere Observing System (AOS) project. Currently in pre-phase A, Joe is developing AOS' IMS and master schedules for the project. The AOS project is giving Joe the opportunity to witness and participate in a project from the early stages and has already proven to be a rewarding experience.

Although Joe's primary career path is that of a project scheduler, he has been very fortunate to be given the opportunities to incorporate his personal passion for composing music with his work at NASA. Joe has worked on several NASA media projects that include a video on Search and Rescue aiding in hurricane response efforts, ESC intern videos, the Transiting Exoplanet Survey Satellite (TESS) ABCs of Exoplanets interactive website, an Artemis I communications profile video, and LandSat-9 introduction and webpage videos.

Over the last 10 years at NASA Goddard, Joe has built some truly remarkable friendships and he has really enjoyed working with everyone along the way.

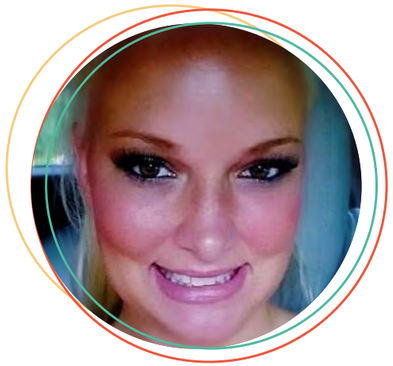
Life Outside Goddard

Joe and his wife live in Odenton, MD with their 2-year-old son. Outside of work, Joe enjoys spending his days relaxing with his family and friends. He finds great joy in providing his son with opportunities to learn and explore through nature and hands-on activities. Being the youngest of five siblings, Joe has always been the jokester of the family and that has yet to change! When he is not spending time with his family, one of Joe's greatest passions is composing music for songs, film and video. Over the past 10 years, Joe has been able to grow his business and has had the opportunity to compose music that is used in motivational videos, short films, educational videos and other forms of media. ■



Joe enjoys pursuing his passion for composing music and sharing that love of music with his young son.. CREDIT: ALL PHOTOS COURTESY OF JOE HARTNETT

> "Never stop pursuing your passions, no matter how busy life gets."
>
> **Joe Hartnett**



Kelly Hyde

Space Science Mission Operations Project (Code 444)
Senior Project Support Manager

Born Baltimore, MD

Life Before Goddard

Kelly was born and raised in Maryland. She wasn't sure what she wanted to be when she grew up but never imagined she would end up working for NASA, even if working for NASA runs in her family tree. Her senior year of high school was spent interning to be an early childhood educator. She has a deep love for children but found teaching wasn't her true passion. She also worked for a local hospital in the radiology department and found the medical field fascinating. Kelly decided radiology school would be her end goal but little did she know NASA would take preference.

Life at Goddard

Following in her grandparents' footsteps, Kelly started her NASA journey in 2004. Kelly is the granddaughter of the late Ron (Project Manager - San Marco an Italian Satellite with the University of Roma) and Mary Adkins (Administrative Officer- Flight Projects Directorate). She started as a data entry specialist in the accounts payable department (Code 155) under the PAAC contract. Data entry only lasted a few weeks and then she was promoted to 'paying the bills,' eventually arranging for payment of contracts and Goddard's freight invoices. Unfortunately, this role transitioned to the NASA Shared Services Center a few years after she joined the team. Although she didn't know it at the time, this led her to her true passion – providing project support.

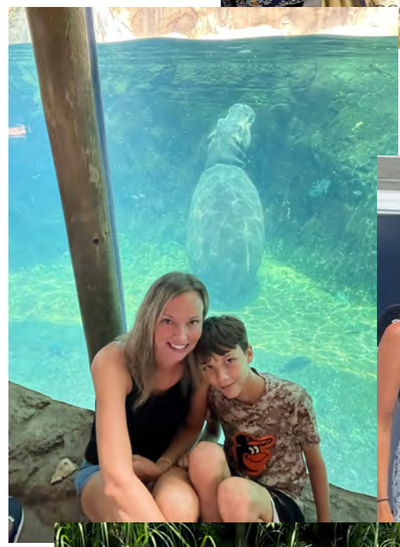
Kelly transitioned to the Global Precipitation Measurement (GPM) project as a new Project Support Specialist. She supported GPM for a few years before transitioning to the Space Science Mission Operations (SSMO) project. She became a civil servant in 2014 as the lead division secretary for the software engineering division (Code 580). Kelly returned to the SSMO project shortly afterwards as a Project Support Assistant. She still supports the SSMO project today, as she has for the last 11 years, as the Senior Project Support Manager.

SSMO has allowed Kelly to grow and advance in her career and experience many historical events. Most recently, she supported the Origins, Spectral Interpretation, Resource Identification, Security, Regolith Explorer (OSIRIS-Rex) Touch-and-Go (TAG) of asteroid Bennu during a global pandemic. Supporting over 20 missions makes her day-to-day work exciting and unpredictable. She wouldn't have it any other way.

Life Outside Goddard

Kelly lives in Pasadena, Maryland with her husband Kenny and their two children, Ryleigh (14) and Brian (12). Ryleigh attended the Goddard Child Development Center for preschool. They have a Boston Terrier puppy (Piper) who joined the family before the pandemic. Her weekends are spent at the baseball field with her family and her son's travel baseball team. When not cheering on her favorite player, you can find Kelly in the gym lifting weights or looking for a beach with her daughter. It has been two years since Kelly started her fitness journey and developed a love for the gym. It was thanks to her SSMO family that she started her fitness journey and continues it to this day. In addition to lifting weights, she enjoys taking bike rides and finding adventures. ■

Kelly enjoys outreach activities and spending time with family.
CREDIT: ALL PHOTOS COURTESY OF KELLY HYDE

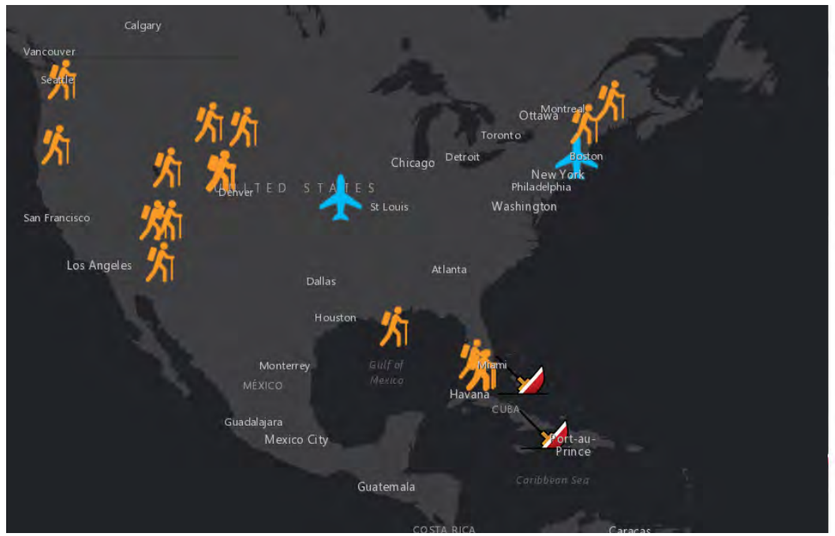


"Life is not measured by the number of breaths we take, but by the moments that take our breath away."

Unknown

THE LATEST SAR SAVES

NASA'S SEARCH AND RESCUE (SAR) OFFICE CONTINUES ITS EFFORTS TO DEVELOP AND IMPROVE ON LIFE-SAVING DISTRESS BEACON TECHNOLOGIES.



Each icon on this map represents one rescue event, though multiple saves may be involved with each event. The Search and Rescue Satellite Aided Tracking (SARSAT) system is able to detect three types of beacons:

Personal Locator Beacons (PLBs)

Used primarily by hikers and outdoor enthusiasts

Emergency Position Indicating Radio Beacons (EPIRBs)

Used by commercial and recreation ships

Emergency Locator Transmitters (ELTs)

Used by civilian aircraft

COSPAS-SARSAT rescues from March 2021 through July 2021 are shown above.

Did you know that while equality and equity may sound similar, they have very different meanings? Equality means that each individual or group is given the same resources or opportunities. Equity recognizes that each person or group has different circumstances (perhaps outside of their influence or control) that resources or opportunities are allocated to reach an equal outcome.

DID YOU KNOW..?

We want to be in the know!

If you have something to share, send it to Matthew Ritsko. Include your **name, phone number** and send it to:

matthew.w.ritsko@nasa.gov
Code 400 Diversity and Inclusion Committee
Ext. 6-2515

Coming and Goings

April 1 through June 30, 2021

Comings

Jamie Esper (599) to 450.2/ Lunar-Communications Relay and Navigation Services (L-CRNS)

Jessica Knizhnik (581) to 472/ Joint Polar Satellite System (JPSS) Flight

Eric Harris (566) to 457/Near Space Network (NSN) Project

Goings

Phuc Nguyen (492) to 560

Kathy McIntyre (427) Retirement

Janice Smith (474) Retirement

John Hudiburg (450) to HQ

Jerome Miller (405) Retirement

Andy Carson (460) Retirement

Reassignments/ Realignments Details within Code 400

Bob Caffrey (401) to 465/Geospace Dynamics Constellation (GDC)

Joe Stevens (401) to 494.1/ Dragonfly

Vickie Moran (401) to 420/The Aerosol, Cloud Convection and Precipitation (ACCP) Study

Jennifer Baldwin (458) to 457/NSN

David Littmann (458) to 435/ Mars Sample Return (MSR) the Capture, Containment, and Return System Project (CCRS)

Karen Rogers / Code 400
Administrative Officer

IN MEMORIAM

David Jacintho
March 25, 1962 to May 16, 2021

David Jacintho's career at GSFC spanned more than four decades. During this time he made significant contributions to the missions involving the Mission Operations Directorate, the Tracking and Data Tracking Satellite (TDRS) and the Space Communications and Navigation (SCaN) project offices (Space Communications missions), the Earth Observing-1 (EO-1), and the Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation (CALIPSO) project offices (Earth Science missions), The Laser Interferometer Space Antenna (LISA) project office (Astrophysics Space mission), and his current role with the On-orbit Servicing, Assembly and Manufacturing project office (Technology Development mission). David's extensive knowledge of project management, NASA's business systems, financial management and team leadership, as well as his many practical skills made him one of the most valuable and sought after team members in GSFC's community. He was also involved with other community activities on Center including serving as the Manager for the Goddard Softball League Champions in 2009 – the Gnats, and had also been named as the Manager of the Year. David will be remembered for his passion for NASA, his warmth, cheerfulness, good humor, and he will be profoundly missed by all whose lives he touched. ■

Kevin Miller / Code 155
Division Business Manager
NASA Exploration and In-Space Services Projects Division (NExIS)

OUT & ABOUT

LIFE'S HIGHLIGHTS OFF CAMPUS

On May 6, Donna Swann (400) and her husband, Jody, became grandparents for the third time with the birth of Michael Joseph Swann, weighing in at 9.5 lbs. and 21-½ inches long. Pictured here at 3 months, MJ is growing quickly, and Gram is enjoying all the cuddles and squeals he willingly shares.

Best wishes to Alex Kempler (155.1/470) and his wife, Nicole, who welcomed their first child, Cruz Alexander Agnew Kempler, on May 11. Cruz's birth weight was 7 lbs., 5.8 oz., and measured at 20.75 inches long.

Christa Kronser (400) and her husband Ben Rollins welcomed Killian Andrew Rollins on June 23, 2021 at 12:03 p.m. He weighed 7 lbs. 3 oz. and was 19.75 inches long.

Emily Heiges (448) and her husband Cory welcomed baby Claire Eliza Heiges on July 14, 2021. Claire weighed 5 lbs. 1 oz. and was 18 inches long.

Share your news!
Weddings, births, interesting travel experiences…we want to know!

Please send your inputs to Paula Wood. Include your **name, phone number** to:

paula.l.wood@nasa.gov
Code 460
Ext. 6-9125

Congratulations to Colin Vogel (480/596). The month of April was big for them. He and his wife, Rachel purchased a new home in the Locust Point neighborhood in Baltimore. They are very happy there, and their dog, Oz, is loving the place!

Also in April, Colin became an uncle for the first time, with the birth of his nephew, Houston. Appropriately, he gave him a onesie that says, "Houston, we have a problem"!

Congratulations to Lauren Alvey (483) who married Mat Birney on June 29, 2021 in the Virgin Islands.

Congratulations to Leticia and Rich Wiley (448), who were married on July 28, 2021 in Baltimore, Maryland.

FLIGHT PROJECTS
LAUNCH SCHEDULE 2021-2022

FALL

Laser Communications Relay Demonstration (LCRD)

Lucy

Landsat 9

WINTER

Geostationary Operational Environmental Satellite (GOES-T)

James Webb Space Telescope (JWST)